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UG CHEMICAL WARFARE
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Information for Medical Officers

Gas Warfare

PREPARED IN THE OFFICE
OF THE SURGEON GEN-
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NOTES ON GAS WARFARE

THE subject of attack by gas is developing in all the services toward the greater importance of gas projectiles. Attack with projectiles allows of much greater opportunity for surprise than does the use of cloud gas, and it is also becoming more important to be on guard against projectile attacks of great intensity, producing very high concentration of poisonous gas in relatively short divisions of the front. Offensive gas officers are working toward the delivery of highly concentrated gases directly upon localities where relatively large numbers of men are congregated. "Direct hits" of this character must be looked for.

GERMAN EXPERIENCE.

Data is at hand relating to the experience of the Germans up to the end of August, 1917. The following from this source should prove of value to every medical officer.

PROPHYLAXIS.

Practice with the mask in order to be in readiness to meet the attack is of great importance.

TREATMENT AT THE AID OR DRESSING STATION.

Rest to the prevention of every bodily exertion is insisted upon. The clothing is removed in order to allow its thorough ventilation, presuming that it contains gas. Morphine is distinctly forbidden. Digitalis is given intravenously. If the heart's action is weak, caffein is given subcutaneously. Venesection is done on severe cases up to 200 to 600 c. c. of blood,

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according to the degree of pulmonary edema. The greater the edema the less blood is drawn, because where much edema already has appeared the blood has become concentrated. The pulse also is watched as a guide to the stopping of venesection. Surgical venesection is done with free exposure of the vein. When there is great concentration of the blood and it refuses to flow, the radial artery is opened and later ligated.

OXYGEN INHALATION.

Oxygen is given according to the severity of the case for two periods of 10 minutes every hour up to four periods of 10 minutes every hour. At least 6 liters a minute is given. The breathing bag is never allowed to become empty.

IN THE HOSPITAL.

Cardiac stimulants are given, digitalis or strophanthus. If time is important, caffeine and camphor are added. Oxygen is given according to the requirements, and venesection if it has not been done. After this, calcium chloride in solution is given subcutaneously in at least four different parts of the body. The solution consists of 1 per cent calcium chloride in 0.5 per cent sodium-chloride solution. Novocain is used to relieve pain, and up to 800 c. c. of the calcium-chloride solution is given. This drug is believed to be indicated in severe cases and strict asepsis is necessary to prevent necrosis.

Experiments on animals with calcium chloride apparently have proved its value. Of 24 treated animals, 55 per cent died; of 24 untreated animals, 88 per cent died. Adrenalin is encouraged if the blood pressure is low. Atropin and artificial respiration are forbidden. Small doses of veronal and codeine are given to relieve the cough, and menthol and alcohol are given



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by inhalation to relieve pain. Fluid must be freely given, possibly by enemata.

IMPORTANCE OF DISCIPLINE.

It is of importance to know that in the British Service the mask is always carried in the "alert position" when in the danger zone, which may be a considerable distance behind the front line. This is required because of the danger from gas shells. It is easily possible for a column of marching men to walk into an air pocket of gas, and if the men are unprotected, casualties will occur. British officers state that false unconcern, a spirit of fear of possible ridicule, has kept men from putting on masks and so has caused casualties. When there is danger of gas, masks *must* be required.

NOTE ON EXPERIMENTAL DATA.

The following extract is taken from a research report made by Yandell Henderson, engaged in investigations under our Gas Defense Service:

There are at least four ways in which venesection probably may influence the condition of the gassed animal—

1. The asphyxial condition present would be improved by the increased hemoglobin accompanying bleeding.
2. The acidosis incident to gassing probably also would be counteracted by bleeding because of the increased alkali reserve of the blood.
3. Bleeding would remove from the organism in large measure any possible toxic substances formed as a result of the gassing.
4. Bleeding would alleviate the condition of the pulmonary edema.

Experiments are being conducted with a view to improvements in the treatment of gassed cases.





